

number of supplementary keys for controlling added-feature functions. In the case of portable telephones, the provision of a large number of input keys is impossible precisely because of the aimed-at minimization of the volume. As such, it is known to perform alphanumeric inputting and to implement a wide variety of functions by multiple assignment of the numerical keys and menu prompting controlled by a small number of supplementary keys.

Touch-sensitive displays, what are referred to as touch screens, in which the user makes an input by applying point pressure to the surface which serves simultaneously as a display field and input field, have also been known for a long time. In higher quality designs, such touch screens permit inputs to be made by handwriting. They have come to be a widespread display and input device for relatively complex hand-held electronic devices, for example for organizers, PDAs or hand-held PCs.

Touch screens are costly and mechanically sensitive components which require mechanical protection in the unused state; particularly in view of their high cost which makes up a considerable portion of the price of organizers or PDAs, etc. This protective function is usually performed by covers which are slid or folded over the touch screen. These covers generally prevent the touch screen, and thus the device, from being used in the protected state. In another widespread design, organizers or hand-held PCs include two part housings, one of which is fitted with an input keypad on its surface and the other with a display. In the closed state, the display and input keypad are situated one over the other, protected in the interior of the closed housing.

The development of the mobile telephone sector into a mass market has also seen the development of combination devices which advantageously combine the functions of a mobile telephone and those of an organizer or PDA. Such combination devices are usually composed of two part housings which are connected to one another in a foldable fashion via a hinge. Such devices, which can be referred to as multi-function mobile telephones, are designed in one embodiment as a folding housing of the type of the above-mentioned organizers or PDA with a conventional input keypad and conventional LCD display. In a further

known embodiment, such mobile telephones have a touch screen onto which a telephone keypad is folded in the function as a mobile telephone, while this keypad is folded away in the organizer function and exposes the entire touch screen. This enables the entire organizer or PDA functionality to be used. In telephone mode, the cover also exposes part of the touch screen, providing a reduced display for operating the telephone. In this case, a different display mode from that of the organizer function (“portrait” representation instead of “landscape” representation) is, of course, selected.

The known portable telephones of this type are still extremely bulky, which is due, inter alia, to the fact that an appropriate and convenient organizer function requires a certain size of the touch screen, and there is still the necessity to accommodate further, in some cases relatively large, input elements and output elements on the surface of the device.

The present invention is, therefore, directed toward an improved portable
15 telephone which constitutes the implementation of a relatively large touch screen
with minimal housing dimensions.

SUMMARY OF THE INVENTION

The present invention includes the essential idea of reserving that surface of the device which holds the touch screen as far as possible solely for the touch screen and of refraining from accommodating any other functional components on the surface. This permits the housing to be shortened.

In one preferred embodiment of the present invention, the customary user behavior is appealed to, in particular, by the fact that the input parts for the telephone mode are embodied as a conventional mobile phone keypad. In a first embodiment of such a keypad, the keys on the reverse side, facing the touch screen, of the second part of the housing which is fitted with the keypad each have a pressure pin. A suitable embodiment, known per se, of the keys with what are referred to as “snap-action disks” or similar parts can, in addition to the familiar external appearance of a mobile phone keypad, also provide comparable activation feedback. In another embodiment, the input keypad is an independent mobile phone keypad which is completely separate from the touch screen. This keypad

can be designed in the way which is customary with mobile telephones or, in order to make the overall size as small as possible, can be provided with a film keypad or similarly flat keypad.

In an alternative embodiment of the present invention, which is even easier
5 and more cost-effective to implement, the input parts are formed by recesses in the second part of the housing (which has essentially only the function of a cover here) in conjunction with input fields represented on the touch screen. A keypad is, as it were, "simulated" by the interaction of recesses and touch screen input fields. The advantage of great simplicity is, however, compromised in this embodiment by
10 certain ergonomic disadvantages.

In a preferred mechanical embodiment, which is known per se, the two parts of the housing are connected to one another by a hinge and can be pivoted with respect to one another. The second part of the housing essentially entirely exposes the touch screen in a first pivoted position, and essentially completely covers it in a
15 second pivoted position (in which the telephone mode is implemented).

In an alternative embodiment to the above, the two parts of the housing are connected to one another in a displaceable fashion via respective guides. Here, the touch screen is entirely exposed in a first position, the organizer/PDA operating position, and covered in a second position, the telephone operating position.

In both embodiments, the second part of the housing has a window through
20 which the part of the touch screen which is essential for a telephone mode can be viewed, but which, together with the other regions of the second part of the housing, covers the entire surface of the sensitive touch screen and protects it against damage. In one particularly simple embodiment, this window can, however, be omitted and a
25 simple housing cutout provided in its place.

The proposed device advantageously has an input function change-over switch which is actuated when the two parts of the housing move relative to one another and brings about a change-over between a touch screen input mode (organizer/PDA mode) and a keypad input mode (telephone mode), part of the touch
30 screen being switched in a special way as a telephone display in the latter mode.

In one appropriate embodiment of the housing shells, a recess for holding an input pin for activating the touch screen is advantageously provided on its side, where the pin is always to hand, preferably attached in a captive fashion.

Additional features and advantages of the present invention are described
5 in, and will be apparent from, the following Detailed Description of the Invention
and the Figures.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows an oblique view of a mobile telephone according to an embodiment of the present invention with a closed housing.

Figure 2 shows an oblique view of the mobile telephone shown in Figure 1 with the housing opened and the touch screen exposed.

DETAILED DESCRIPTION OF THE INVENTION

Figures 1 and 2 show a perspective view of a mobile telephone 1 with the supplementary functionality of a palmtop. The mobile telephone 1 includes a first housing part 3 and a second housing part 5, which are connected to one another in a pivoting fashion via a two-part folding hinge 7a, 7b on one longitudinal side.

A touch screen 9 which occupies virtually the entire surface is provided on the upper side of the first housing part 3 as an input and display device of the mobile telephone in the palmtop operating mode. In one side face 3a of the first housing part 3, a recess 11 for a ballpoint pen 13, which serves as an input pin for the touch screen 9, is provided. Furthermore, the first housing part is fitted with an antenna 15 and has a connecting bushing 17 for a data line. A microphone (a telephone transmitter) 19 is positioned on the lower end face 3b of the first housing part 3.

The upper side of the second housing part can be seen in Figure 1 and its lower side (in the folded-open state of the mobile telephone 1) can be seen in Figure 2. In Figure 1, it is apparent that a telephone receiver 21 and an input keypad 23 for implementing the telephone functions are accommodated in the second housing part 5. A display window 25 is provided between the telephone receiver 21 and the input keypad 23 (in the arrangement which is customary per se in mobile telephones), the display window 25 exposing a section 9a of the touch screen 9 to the user's view even when a housing of the mobile telephone 1 is closed. The input keypad 23 is, as

is apparent from Figure 2, embodied on its underside facing the surface of the touch screen 9 as a mechanical key array 23' via which pressure is exerted on a specific region of the touch screen 9 when a key is actuated, and a numerical input or a function in the telephone mode is triggered. For this purpose, for example a blunt plastic or hard-rubber pressure pin 23.1 can be connected to each key and the key can be prestressed in an upward direction by a spring element.

In the closed state of the mobile telephone 1, the touch screen 9 is actuated in the telephone mode in such a way that the configuration of the pressure pin array 23' of the input keypad 23 is assigned an input mask using the mobile telephone MMI (Man-Machine Interface) of a conventional mobile telephone.

In the opened state shown in Figure 2, a PC user interface is activated, wherein a respective start menu is firstly called when the cover is opened. In order to change over between the operating modes, a change-over switch 27 which is embodied as a key button is provided on the underside of the second housing part 5, which key button can, of course, be used to change over the display and the input mode of the touch screen at the same time as the change-over of the mode of operation. In order to connect the telephone receiver 21 and the change-over switch 27 to the printed circuit board of the mobile telephone, a line which runs within the folding hinge 7b and which leads out of the second part 5 of the housing into the first part 3 of the housing is provided.

The present invention is not restricted to the exemplary embodiment described, but rather is also possible in a multiplicity of refinements within the scope of activity by a person skilled in the art. In particular, refinements in terms of the specific arrangement of the telephone transmitter and telephone receiver are possible, the arrangement of the relatively bulky telephone receiver in the second housing part covering a section of the touch screen constituting an essential feature of the present invention. It permits, in particular, the telephone housing to be shortened, corresponding to an important desire on the part of customers.

A recess for an input pin also can be provided at another location; for example, in the base region of the first housing part or else on the second housing part. However, it also can be dispensed with.

Instead of the mobile telephone described above, a cordless telephone with expanded functionality also may be embodied in the way explained in order to provide a display and input screen which is as large as possible in area for the supplementary function (database, pocket translator, organizer or the like) with
5 minimum housing dimensions.

Indeed, although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.